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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/764,574	01/27/2004	Masaki Katagiri	001458.00042	9018
22907	7590	04/19/2005	EXAMINER	
ROSENBERGER, FREDERICK F				
ART UNIT		PAPER NUMBER		
2878				

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/764,574	KATAGIRI ET AL.	
	Examiner Frederick F. Rosenberger	Art Unit 2878	

**– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –**

### **Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)  Responsive to communication(s) filed on 27 January 2004.

2a)  This action is **FINAL**.                            2b)  This action is non-final.

3)  Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## **Disposition of Claims**

4)  Claim(s) 1-6 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5)  Claim(s) 1,2 and 4 is/are allowed.

6)  Claim(s) 3,5 and 6 is/are rejected.

7)  Claim(s) \_\_\_\_\_ is/are objected to.

8)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

9)  The specification is objected to by the Examiner.

10)  The drawing(s) filed on 27 January 2004 is/are: a)  accepted or b)  objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)  The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a)  All    b)  Some \* c)  None of:  
1.  Certified copies of the priority documents have been received.  
2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3.  Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)  Notice of References Cited (PTO-892)  
2)  Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3)  Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/27/04.

4)  Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_ .  
5)  Notice of Informal Patent Application (PTO-152)  
6)  Other: \_\_\_\_\_ .

## **DETAILED ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Drawings***

2. Figure 11 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

3. The disclosure is objected to because of the following informalities:

On page 5, line 27, "it follows a Ge..." should be "it follows that a Ge...".

On page 9, line 4, the described Sn layer is shown as a SnAl layer in Figure 5.

On page 10, line 7, the described Sn layer is shown as a SnAl layer in Figure 7.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relation between the preamplifier, the amplifier, and the solid-state radiation detector.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. Claim 3 is rejected under 35 U.S.C. 102(a) as being anticipated by Kanno et al. (Journal article entitled "Cryogenic InSb detector for radiation measurements").

Kanno et al. disclose a solid-state radiation detector comprising a single crystal of p-type InSb doped with Ge (page 2534, top of column 1), a pn junction formed in the p-type InSb single crystal, provided by evaporation of the Mo electrode atop the p-type wafer (page 2534, column 1, 1<sup>st</sup> full paragraph), wherein the device provides diode characteristics (Figure 2) when operated at 4.2K (page 2535, top of column 1).

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kanno et al., as applied to claim 3 above, and further in view of Okamoto et al. (Conference paper entitled "Transportation phenomena of Sn-doped InSb thin films and application to Hall element").

Kanno et al. disclose all the limitations of the parent claim 3, as described above, but are silent with regards to the additional limitations of claim 6, i.e. the formation of the pn junction through thermal diffusion of the metal Sn to form an n-type electrode. Kanno et al. only teach the evaporation of the metal Mo to form the electrode.

Okamoto et al., in a paper related to the temperature dependent properties of InSb, teach that Sn-doping of InSb is preferential because it increases electron mobility

with decreasing temperature (page 219, paragraph 3) while the temperature dependence of the resistivity of the doped InSb is reduced (page 219, paragraph 1).

Thus, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use Sn in place of Mo to provide an n-type electrode to form the pn junction to increase electron mobility and decrease resistivity variations, as taught by Okamoto et al.

***Allowable Subject Matter***

10. Claims 1, 2, and 4 are allowed.

11. The following is an examiner's statement of reasons for allowance:

Claim 1 is directed towards a solid-state radiation detector wherein a surface barrier layer is formed on top of high-purity undoped single crystal indium antimonide (InSb) to create a semiconductor device with diode characteristics operating within a temperature range between 2K and 50K. Claim 2 is directed towards a solid-state radiation detector wherein a pn junction is formed in the high-purity undoped single crystal InSb to create a semiconductor device with diode characteristics operating within a temperature range between 2K and 115K. While radiation sensitive semiconductor devices employing InSb operating at cryogenic temperatures can be found in the prior art, there is no teaching or motivation in the prior art for using an undoped InSb single crystal at cryogenic temperatures. The prior art primarily teaches various doped InSb configurations for infrared detection. As such, applicant's disclosure provides a novel

and nonobvious improvement over the prior art. Accordingly, the claims 1 and 2 would be allowable. Claim 4 would be allowable by virtue of its dependence on claim 2.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yves et al. (US Patent # 4,696,094) disclose a semiconductor photodiode wherein the substrate is a p-type InSb single crystal and n-type regions for the p-n junctions are provided by ionic implantation of sulphur isotopes.

Rogers (US patent # 3,723,831) disclose an infrared detector wherein the substrate is an n-type InSb single crystal with a p-n junction operated at temperatures between 77K and 145K.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Frederick F. Rosenberger whose telephone number is 571-272-6107. The examiner can normally be reached on Monday-Friday 7:30 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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